

Claims

1. An implantable apparatus for controlling fluid flow within a host body comprising:
a constricting member for allowing fluid flow within a body canal when in an open position and for reducing fluid flow within a body canal when in a closed position;
an actuating member for operating the constricting member between said open and closed positions; and
control means for operating said actuating member.
2. The implantable apparatus of claim 1, wherein said constricting member comprises a first engaging element and a second engaging element for coupling to the first engaging element to encircle said body canal.
3. The implantable apparatus of claim 2, wherein at least one of the first engaging element and the second engaging elements has apertures to allow tissue growth therethrough from and to the surface of the body canal.
4. The implantable apparatus of claim 2, further comprising a locking member for locking the first engaging element and second engaging element into a locked position.
5. The implantable apparatus of claim 1, wherein said constricting member comprises a plunging member moveable such that the plunging member may apply pressure against said body canal to compress said body canal into said closed position.
6. The implantable apparatus of claim 5, wherein said actuating member comprises a link member having a first and second end.

7. The implantable apparatus of claim 6, wherein the first end of the link member is attached to said plunging member and is axially moveable by said control means to move said plunging member.
8. The implantable apparatus of claim 6, wherein said actuating member comprises a housing whereby the second end of the connector extends slidably through an aperture in the housing and is coupled to an actuator provided in the housing such that movement of the actuator results in movement of said plunging member away from the body canal to allow at least some fluid flow therethrough.
9. The implantable apparatus of claim 6, wherein said actuating member comprises a motor operatively coupled to the second end of the connector so that activation of the motor causes the second end of the link member to be axially pulled towards the motor resulting in movement of said plunging member away from the body canal to allow at least some fluid flow therethrough.
10. The implantable apparatus of claim 9, further comprising a trigger mechanism for activating the motor.
11. The implantable apparatus of claim 6, wherein said actuating member comprises a magnetic unit coupled to the second end of the connector so that activation of the magnetic unit causes the second end of the connector to be axially moved, resulting in movement of said plunging member away from the body canal to allow at least some fluid flow therethrough.
12. The implantable apparatus of claim 11, further comprising a manual override system including an additional magnet having sufficient magnetic force to activate said magnetic unit coupled to said second end of the connector from outside the host body.

13. An implantable apparatus for controlling fluid flow within a host body comprising:
 - a constricting member for restricting fluid flow within a body canal when in a closed position, and for allowing fluid flow within the body canal when in an open position;
 - a control mechanism for controlling movement of the constricting member between said open and closed positions; and
 - a link member linking the constricting member and the control mechanism such that the constricting member and the control mechanism are implantable in different parts of the host body.
14. The implantable apparatus of claim 13, wherein said control mechanism is separable from said link member, whereby said control mechanism may be replaced without removal of the constricting member or the link member from the host body.
15. The implantable apparatus of claim 14, wherein:
 - the link member is adapted for actuating said constricting member between said open and closed positions so as to alter fluid flow within the body canal; and
 - an actuating member is provided for actuating said linking member.
16. The implantable apparatus of claim 15, wherein the actuating member and the control mechanism are provided in a housing separate from the constricting member.
17. The implantable apparatus of claim 15, wherein the actuating member comprises a motor.
18. The implantable apparatus of claim 17, further comprising a remotely operated trigger mechanism for activating the motor.

19. The implantable apparatus of claim 17, wherein a coupling for selectively transmitting axial movement from said motor to said link member is provided between said link member and said motor.
20. The implantable apparatus of claim 19, wherein said coupling comprises a compressible member.
21. The implantable apparatus of claim 20, wherein the compressible member is provided in a moveable casing, and wherein said link member is operatively connected to said compressible member, the motor acting to move said casing, said compressible member acting to move said link member.
22. The implantable apparatus of claim 19, wherein said coupling comprises magnets.
23. The implantable apparatus of claim 22, wherein said coupling comprises a magnet attached to an end of said link member, and at least one magnet attached to said operating means.
24. The implantable apparatus of claim 23, wherein said at least one magnet attached to said operating means is generally annular, and extends around said magnet attached to said link member.
25. A seal for an elongated link member, said link member extending between an implantable apparatus for implantation in a host body and a control mechanism, the link member extending through an opening in a housing, wherein the seal comprises:
 - a tubular membrane having two openings, one opening being sealed to said housing, the other said opening being sealed to said link member such that fluid entering

- said housing around said link member is trapped by said membrane, said membrane flexing to allow movement of the shaft.
26. The seal of claim 25, wherein said membrane is sealed to said link member by gripping means extending around said membrane and said shaft.
27. The seal of claim 26, wherein said gripping means comprises a coil.
28. The seal of claim 25, wherein said membrane comprises a bellows that folds inwardly when the link member is moved axially away from an interior the housing, and expands when the link member is moved axially into the housing.
29. The seal of claim 28, wherein said bellows includes a reinforcing ring so that folding of said bellows is controlled.
30. An operating mechanism for a constricting member for controlling fluid flow in a body canal, the constricting member being actuable between open and closed positions, the operating mechanism comprising:
 an axially moveable link member operatively connected to said constricting member for actuating said constricting member;
 operating means for axially moving said link member; and
 a coupling for selectively transmitting axial movement from said operating means to said link member, said coupling being operatively connected between said link member and said operating means.
31. The operating mechanism of claim 30, wherein said coupling comprises a compressible member.

32. The operating mechanism of claim 31, wherein the compressible member is provided in a moveable casing, and wherein said link member is operatively connected to said compressible member, the motor acting to move said casing, said compressible member acting to move said link member.
33. The operating mechanism of claim 30, wherein said coupling comprises magnets.
34. The operating mechanism of claim 33, wherein said coupling comprises a magnet attached to an end of said link member, and at least one magnet attached to said operating means.
35. The operating mechanism of claim 34, wherein said at least one magnet attached to said operating means is generally annular, and extends around said magnet attached to said link member.
36. The operating mechanism of claim 33, further comprising a manual override system including an additional magnet having sufficient magnetic force to activate said coupling to transmit axial movement to said link member from outside the host body.
37. A method of controlling fluid flow within a host body comprising:
 implanting a constricting member around a body canal, the constricting member reducing fluid flow in the body vessel when in a closed position;
 implanting a control mechanism in the host body;
 providing and implanting a link member between said constricting member and said control mechanism to allow the control mechanism to control the constricting member, wherein said control mechanism may be removed from the host body and replaced without removal of the constricting member and the linking member.

38. The method of claim 37, wherein the constricting member comprises engaging elements defining an opening therebetween, the method comprising surrounding the body canal with said engaging elements so that said body canal extends through said opening.
39. The method of claim 37, comprising suturing the engaging elements to the vessel.
40. The method of claim 37, further comprising implanting the control mechanism remote from the body canal.
41. A remote telemetry system for an implantable apparatus, the telemetry system comprising a signaling mechanism capable of sending and receiving signals to and from a control unit implanted in a host body in order to monitor the operation of the implantable apparatus, the telemetry system being capable of altering operating settings of the implantable apparatus.
42. The remote telemetry system of claim 41, wherein said signals are electromagnetic radiation.
43. The remote telemetry system of claim 42, wherein said signals are radio waves.
44. The remote telemetry system of claim 41, further comprising sensors to monitor actions of the implantable apparatus on the host body, and a mechanism to interrogate said sensors to provide feedback on the sensed data.
45. The remote telemetry system of claim 44, wherein said sensors are capable of monitoring pressure exerted by a moveable part of said implantable apparatus on a part of said host body, the feedback on the sensed data including commands to alter the range of movement of said moveable part of said implantable apparatus.

46. An implantable apparatus for controlling fluid flow in a host body, the implantable apparatus comprising:

a constricting mechanism including a reciprocable member for selectively applying pressure to a canal of the host body in order to selectively constrict said canal;

a pressure sensor for detecting the pressure applied by said reciprocable member to said canal; and

a feedback system for altering movement of said reciprocable member in response to the pressure sensed by said pressure sensor in order to prevent damage to said canal.